



The Influence of Firms on Female Lifecycle Decisions

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Abstract

Recently, a dramatic increase in the labor force participation of women in many countries has occurred. Female lifestyle choices appear to be more flexible than they were earlier. Yet certain cross-national differences remain. What causes these differences to emerge?

My Master's thesis addressed how the decisions of firms regarding family leave influence the decision-making process of women. According to a game theoretic model, the availability and cost of childcare are the two central factors in the explanation of the choices that women make in relation to having a child and returning to work after taking a leave. Moreover, the replacement rate of paternity leave raises the question of the father's participation in taking care of a child. The length of leave strengthens the preference of a child during a leave. Lastly, the possibility of a fine has an effect on the recruitment phase as it might weight the cost of hiring a new employee in case the firms decide not to offer leave. In addition, a laboratory experiment demonstrated the impact of absence on the interactive decision-making between firms and workers. The positive and statistically significant correlation and causality between the wage provision by firms and the effort level set by workers was observed. Moreover, the absence of workers decreased the wage provision and the effort level.

In sum, this study contributed to the way in which female lifecycle decisions are formed theoretically. The influence of firms on the lifecycle decision of female workers was found to be absolutely substantial. The results of the model and the laboratory experiment provided a rigorous scientific foundation for developing the efficient instruments of promoting a gender equal society.

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The marriage of Sir Gawain

This morn as I came over a moor,

I saw a lady set,

Between an oak and a green holly,

All clad in red scarlett.

She says all women would have their will,

This is their chief desire

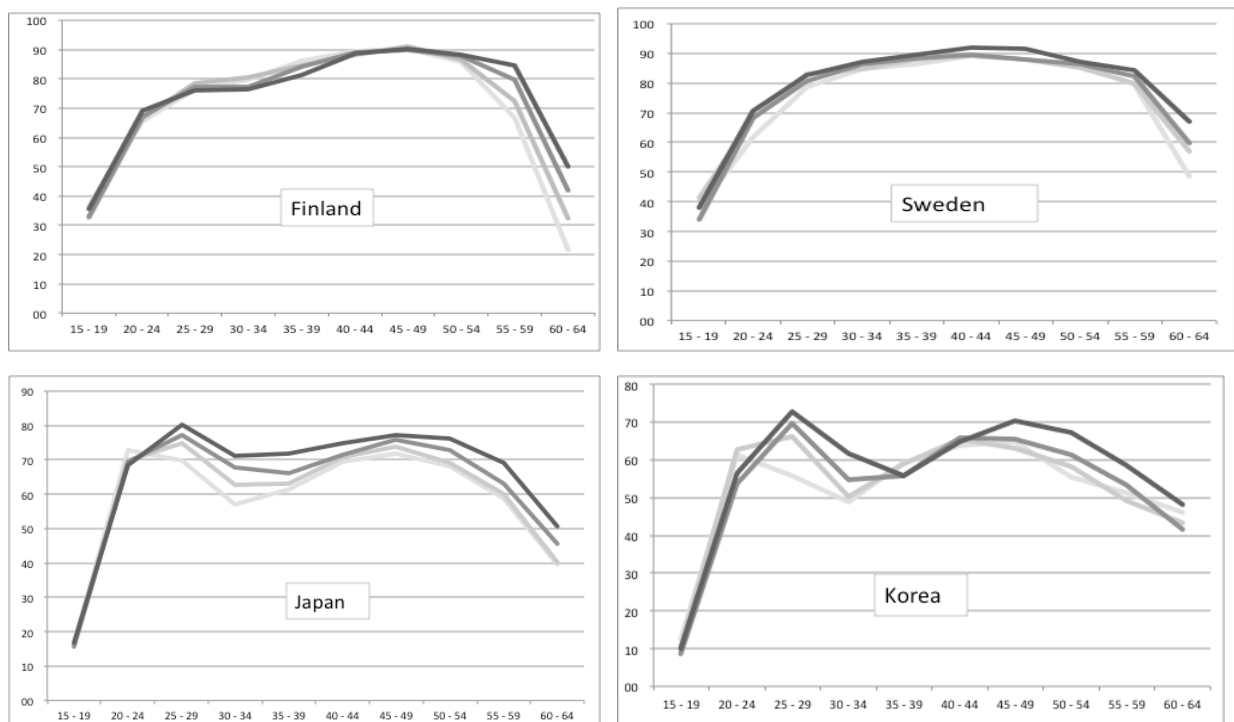
Thomas Bulfinch (1796–1867). (1913). *Age of Fable: Vol. III: The Age of Chivalry*.

New York: Review of Reviews.

1. Introduction

Recently, a dramatic increase in the proportion of females in the labor force has been observed in many industrialized countries (OECD, 2015). This trend is seen in most developed countries. However, the cross-national difference still remains. For example, the OECD data has shown that the participation of female workers in the labor force is relatively high for all age cohorts in European countries, while there has been a significant drop in the middle-age cohort in the East Asian region, especially in Korea and Japan. Figure 1 describes the female labor force participation trend for every five years from 2000 to 2015 and compares the differences between certain Nordic and East Asian countries.

Figure 1 Female labor force participation (OECD)

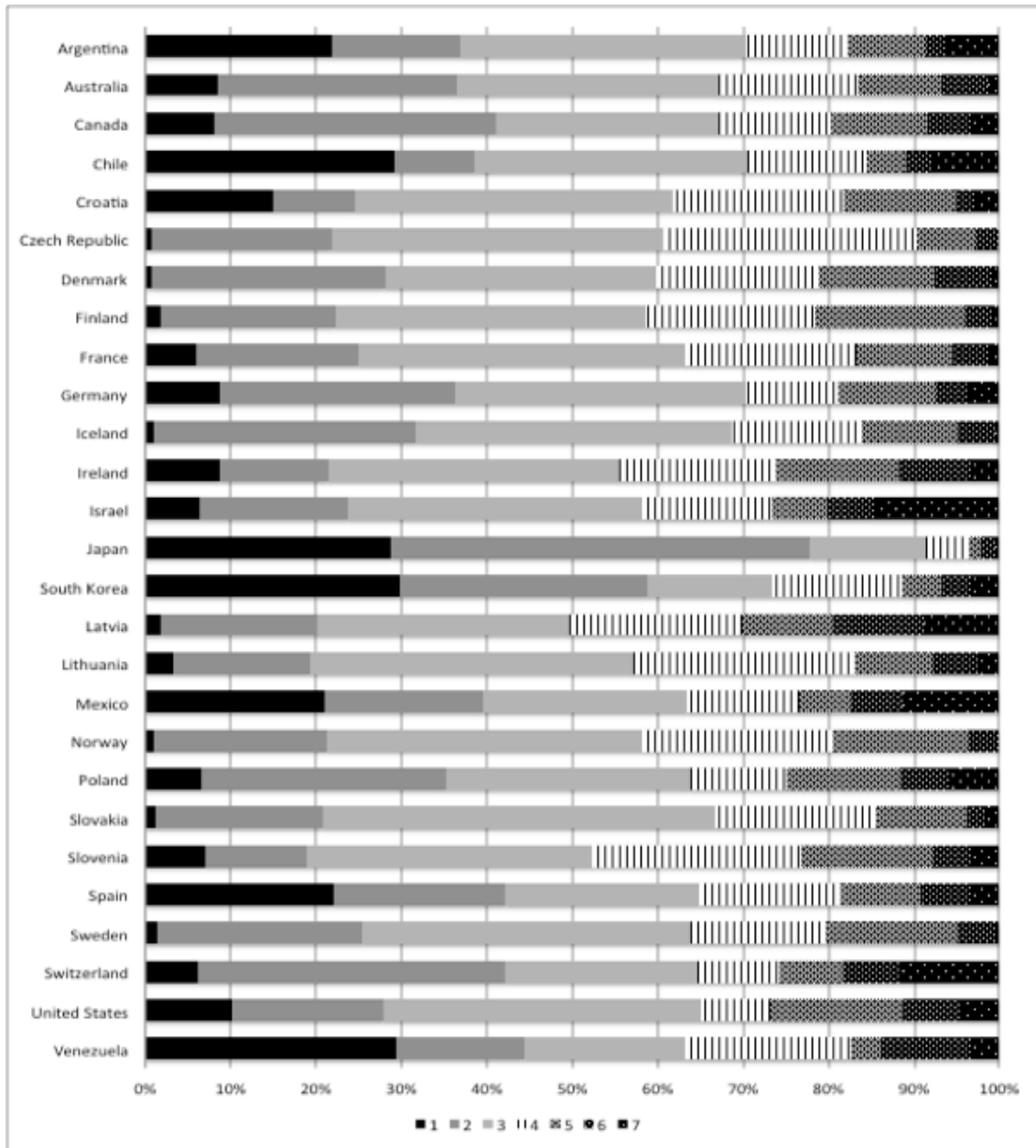


The year: 2000, 2005, 2010, and 2015. The darker the color indicates older cohorts.

According to the county-level data on the four countries in Figure 1, there are several important features that should be noted. First, a dramatic increase in the female labor participation is found in the two East Asian countries: the lines indicating labor force participation are lifting up to the higher percentage level over time. On the other hand, stable rates are observed in the Nordic countries. These rates show that the pattern of the female labor force participation is almost the same over 15 years. Secondly, different shapes in lines are observed in those two areas: the lines denoting the female labor force participation in the Nordic counties take the form of an inverted U-shaped curve, while the M-curve can be described for the picture seen in the Asian counties. What do these shapes reveal? Although the age of entry to the labor market for Finnish women is relatively higher than for Swedish women, the peak of female labor force participation in both countries falls on the middle-aged category. This may be interpreted as the absence of distractions from career, whereas many of Japanese and Korean women clearly leave their office while in their late 20s to return only in their 40s.

As the result of an increase in the labor force participation of women, female life course choices are more flexible than previously: some women may choose between having a career and being a caretaker, while others may balance paid and unpaid work. It appears to be the case that women's life courses are diverse, rather than converging in one direction. According to the previous studies, the income structures within families are shifting from the breadwinner model to the dual earners model in many countries (Stier and Mandel, 2009). The survey data in Figure 2 shows the recent income distribution by households.

Figure 2 The cross-national comparisons on the income distribution within family



ISSP data (2012)¹

Figure 2 was created using the survey data, which was obtained from the International Social

¹ The data for descriptive analysis: the International Social Survey Programme (ISSP Research Group (2014), Family and Changing Gender RoleIV - ISSP 2012) was provided by the GESIS Data Archive in Cologne. In addition, the data presented in Figure 2 are included in the analysis of a forthcoming paper, “Cross-national Analysis on Women’s Economic Contribution”.

Survey Programme data in 2012 (ISSP). The higher number indicates higher income contribution of women within households. As is evident, first, husbands have larger contributions of income within households in most countries. The number from one to three indicates higher contribution by men – and sum of those three numbers exceeds 50% in all the countries shown in Figure2. Yet, it is obvious that cross-national differences remain in the structures of couples. Some countries, for example, Japan, Korea, Chile and Venezuela, have high proportions of breadwinner couples as the number is close to 40%, while other countries such as European countries shows fairly low proportions of husband income oriented couples. Therefore, the determinants of cross-national differences in households' income structures should be discussed.

In this thesis, the determinants of life cycle decisions of women will be addressed. Why has an increase in the female labor force occurred? What is the logical explanation regarding the transformations of family structures? Moreover, the cross-national differences are observed according to the Figure1 and Figure 2 – if this is the case, what causes this variation between countries?

1.1 The Lifecycle Choices of Japanese and Finnish women

Because clear differences are observed in Nordic and East Asian countries, the lifestyle choices of women might differ. Thus, I will compare the life style choices in those countries, from the perspective of having a child, as well as the decisions of paid and non-paid work.

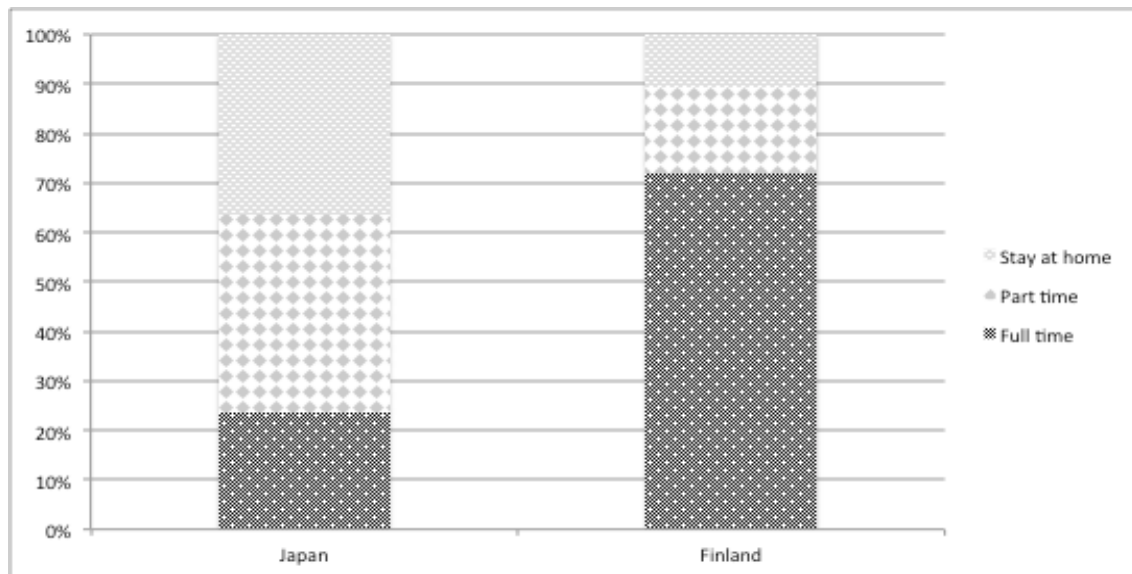
First, what are the statuses of mothers, after the youngest child started school in Finland and Japan?

Figure 3 illustrates the employment status of mothers. This figure was created by ISSP data (2012).

The answers were obtained by questions number 29b and 36b: did you (or spouse, in case of male

respondents) work outside the home, full-time, part-time, or not at all, after the youngest child started school?

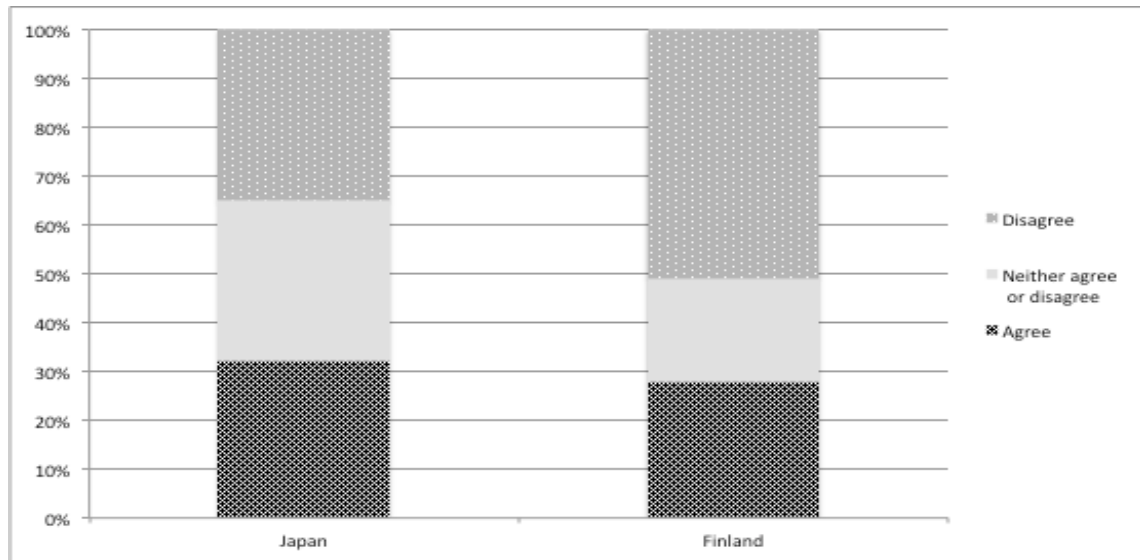
Figure 3 Employment status of mother



According to Figure 3, the employment status of mothers in those two countries is clearly different. For example, many Finnish mothers choose to come back to working life as either full-time or part-time, while approximately 40% of Japanese women stay at home. Moreover, a majority of working mothers chooses to work part-time in Japan, whereas many of them work full-time in Finland. Therefore, these differences in mother's employment status could be one of the reasons of different labor participation in these countries.

Do these differences stem from the will of women? In order to answer the question, the preferences of women should be carefully considered. Using the same data, the opinions toward caring for a child is shown as follows (Figure4). The question used was Q1d 'To what extent do you agree or disagree: a job is all right, but what most women really want is a home and children.'

Figure 4 Preferences toward childcare



The differences in preference of caring a child is not as significant as employment status of mothers – but more women in Finland disagree with the norm that women prefer to stay at home. On the other hand, proportions of those who agree with the question are not substantially different in two countries as around 30%. ‘Neither agree or disagree’ is found in Japan, rather than in Finland.

What are the determinants of decisions on female labor supply and family income balance? Do the preferences of women have effects on decision-making? Understanding the mechanism behind the female decisions is important for policy makers to create efficient supports. Moreover, cross-national differences might be caused by other factors – such as the provision of policies or the influence of employers. The following section will address the determinants on life cycle decisions of female workers, especially the decisions of having a child and working in labor market.

1.2 Theoretical background

In this section, the summary of previous studies on determinants of female lifecycle decisions is

shown. First, the labor supply models, which were mostly developed in economics, will be discussed considering the workers' aspects. Then, the demand side, the firms' perspectives, will be summarized. Lastly, the interactive decision-making process between firms and employees will be considered.

First, the labor supply model has been substantially developed by many studies – these studies have mostly addressed the decisions by households or individuals with considerations of available family policies. Most studies have admitted the fact that female labor force participation is somewhat restricted by presence of a child - especially young children aged fewer than six years old. (Heckmann, 1980; Waldfogel, Higuchi & Abe, 1999). If this is the case, then, how can this negative effect of a child on labor and fertility decisions of women be moderated? According to previous studies, the cost of childcare has effects not only on labor supply decisions, but also on the fertility decisions (Attansio, Low & Sánchez-Marcos, 2008; Adda, Dustmann & Stevens, 2016). Attansio, Low & Sánchez-Marcos (2008) studied the female labor supply with savings decisions of households using simulations, and found out that a decrease in the cost of childcare relative to earnings leads to a great increase in the labor supply of women. Moreover, Adda, Dustmann & Stevens (2016) examined the impact of the cost of children on the relationship between labor supply and the fertility decisions. They found that career choices are strongly associated with fertility decisions – women with higher status occupations tend to have a lower number of children, and the cost of fertility is essential in that it reduces the earnings significantly. Second, Waldfogel et al (1999) showed the fact that family leave policy helps in retention of female workers after childbirth in all countries that were included in their analysis, although there are cross-national differences in the degrees of likelihood. Overall, the labor supply decisions are mainly based on fertility and employment possibility, as well as on the interactive decisions within households, and family policy

plays a large role in supporting decisions of balancing paid work and unpaid work.

The female life cycle is determined not only by households or policies, but also by the decisions made by firms. Arrow (1973) and Phelps (1972) found evidence of statistical discrimination – the discrimination toward minority of groups within the firms. Their theory proved the potential for discriminating behavior of firms towards a group of people, when employers believe the group is inferior to another. On the other hand, some studies have shown that other factors create the discrimination behaviors. For example, Self-fulfilling prophecy was proved by Yamaguchi (2010) using a game-theoretic model – the statistical discrimination stems from the low performance and high turnover rate by female workers, as female workers feel that they will be treated inferior to men by firms. Moreover, Gayle & Golan (2012) found evidence of adverse selections by firms – firms only evaluate the contribution from working hours since workers might hold other information secretly. Furthermore, Thomas (2016) argued that a mandated maternity leave had an effect on decisions of promotion – mandated maternity leave clearly raised the retention of work, while the prospect of promotion is lower than if no-mandate policy was available.

In this thesis, the sequential decision-making processes between firms and women are established using game theoretic model. This theoretic model will consider the effect of several factors on the life cycle decisions of female workers, for instance, family policy, income of the spouse, as well as the previous decisions of each actor. The model will deal with the periods from a start of work to retention of work after the woman gives birth. Furthermore, the women's preferences of having and caring for a child – which is not well considered in life cycle model in previous studies – will be taken into consideration. As previous studies have shown, the presence of a child changes life cycle decisions of women significantly – therefore, it is important to understand the mechanism of

decision-making of female workers and efficiently support her decisions regarding the balance of work and family life. The cross-national variation might be observed in different settings of family policy and female preferences in the life course.

A similar study is found in Kangas & Rostgaard (2007). The authors addressed this issue by examining the impact of institutional factors and preferences on female labor supply in seven European countries, and found out that labor supply is constrained by institutional factors, although workers' preferences matter. The differences in this study and this paper will be found in the different methods of analysis – Kangas & Rostgaard (2007) utilized empirical analysis with several European countries, while this thesis addresses this issue by game theoretic model, which can be applied for any countries' conditions.

1.3 The aim of this study

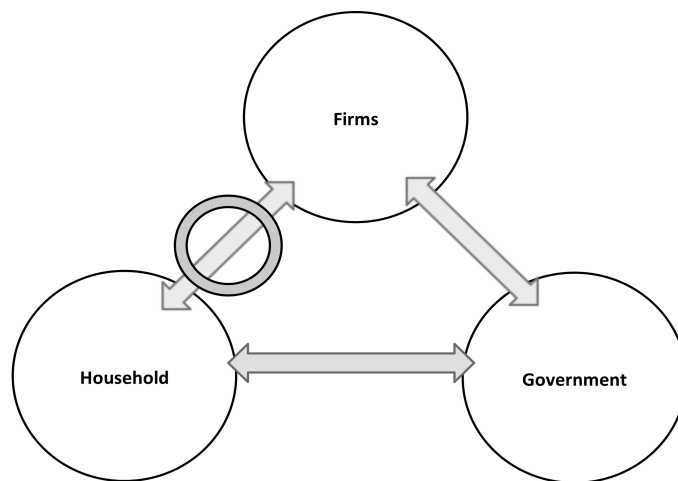
The main purpose of this study is to examine the interactive decision-making process between female workers and firms under a certain provision of family policies, with a consideration of women's lifestyle preferences. In what ways do women choose their careers from various possibilities? Focusing on the provision of family policy and female lifestyle preferences, the process of lifestyle decision was examined with a game theoretic model.

In addition, a laboratory experiment was executed to examine the impact of an absence, during a period of family leave, on the lifecycle decision-making of female workers. Thomas (2016) found in her paper that a mandatory leave policy increased the retention of work, but at the same time, the prospect of promotion got lower. If this is the case, the absence of employees might change the decisions of employers. This motivation behind wage increases or promotions is hard to measure by

theoretic or empirical considerations. Therefore, a laboratory experiment was utilized to observe the effect of absence on the behaviors of employers and employees.

In order to examine the mechanism of the decision-making process between firms and female workers, I will make an assumption that government has no bargaining power to negotiate the decision-making between them. However, the government has a role to enact formal family policy to support female worker's retention of work. Therefore, the main actors in this study are shown in Figure 5 as follows.

Figure5 The main actors



As Figure 5 shows the female lifestyle choices are constructed by multiple factors, such as household features, available policies, and how firms offer policies to women.

1.4 The structure of the thesis

This study will proceed the following chapters as below. First, chapter two will show the literature review of previous studies, in order to capture the theoretic arguments, which have been made so far. The chapter will focus on the impact on life course decision-making process from the

perspective of family policy, the influence of firms, women's economic contribution as well as the individuals' lifestyle preferences, which have been discussed. In chapter three, the game theoretic model, which considers those determinants on life cycle decision of women, will be presented. The game theoretic model will consider the interactive decision-making between a firm and a female worker, (and in a broader sense, the household). Chapter four will cover ambiguous points found in the game theoretic model, by utilizing a laboratory experiment. More precisely, the laboratory experiment will allow me to examine the motivation, which drives the decisions of wage settings and productivity. Furthermore, the impact of absence on interactive decision-making will be examined by my experimental design. Lastly, the results of game theoretic consideration and laboratory experiment will be discussed in chapters five and six.

2. Literature review

This chapter will summarize the previous studies on lifestyle decision-making of female workers. The main focus is on several determinants of lifestyle choices such as the provision of family policy, the influence of firms, female economic contribution within households, as well as female lifestyle preferences.

2.1 The provision of Family policy

Debates surrounding the impact of family policy provision on gender inequality are found in many academic articles from various perspectives. To begin with, what is the prevalent definition of family policy? First, Gornick, Meyers, and Ross (1996, p.3) defined it as:

“...the extent to which policies support the option of employment for women with dependent children. Policies may affect women's employment decisions by encouraging unbroken labor force attachments around the time of childbirth, by increasing the supply or reducing the cost of non maternal child care, or by providing de facto child care via public school schedules that are compatible with parental employment (Gornick et al., 1996, p.3)”

Moreover, Théven (2011) as mentioning six main aims:

“1. Poverty reduction and income maintenance, 2. Direct compensation for the economic cost of children, 3. Fostering employment, 4. Improving gender equity, 5. Support for early childhood

development, and 6. Resining birth rate (Théven, 2011, p.58-59)''.

Therefore, in general, family policy is interpreted as policy, which supports the well-being of families with children aged from childbirth to preschool age, as well as enhances the employment decisions for parents. Moreover, it can be defined as the policy to decrease the gender gap in paid-work, by providing alternative services for unpaid work.

What are the effects of maternity, paternity, and parental leave policy on the lifecycle decision of women? On one side, some researchers advocate the view that family policy enhances the economic standing of women (Kenjoh, 2005), employment continuity (Stier, Lewin-Epstein, & Braun, 2001), and fertility level (Björklund, 2006). On the other hand, others argue that long leave provision and childcare benefits could ultimately have negative effects on the women's career and earning prospects (Rønsen & Sundström, 2001). Moreover, studies on the generous provision of paternity leaves in Sweden found out that the longer paternity leave leads to more equal engagement in childcare and housework (Klinth, 2008; Almqvist & Duvander, 2014).

Childcare is another way for a country to support women's empowerment. The prevalent conclusion about the impact of public childcare on women's employment is that generous public childcare enhances the employment rates among married women and women with young children (Pettit & Hook 2005; Korpi, 2000; Uunk, Kalmijn & Muffels, 2005). This is supported by data considering different points in time (Uuk et al., 2005), as well as cross-national comparisons (Pettit & Hooks, 2005; Korpi, 2000). Therefore, the generous public expenditure supporting childcare

leads to higher female labor participation.

Furthermore, welfare theories have shown some categories, which have similar tendencies in social policy and the labor market outcome, regarding issues of gender inequality in wage differences, labor market participation, or employment status. In the 1990s, Esping-Andersen (1990) provided a great impact on welfare theory, by proposing three welfare states typologies – liberal, conservative, and socio-democratic welfare regimes – using the indicators of de-co modifications in social policies that shows how generous the governmental supports for pensions, sickness, and unemployment are. Following this study, some scholars examined the typologies of the welfare states and the relationship with female employment using cross-national datasets (Gornick et al., 1996; Stier, Lewin-Epstein, & Braun, 2001). They found that although there were intra variations in welfare regimes proposed by Esping-Andersen (1990), both studies concluded that generous governmental supports, which are mostly provided in socio-democratic regimes, lead to high rates of paid work and minimal career disruptions in general. On the other hand, others argued that there is a gender-segregation in types of occupations in socio-democratic countries – a high proportion of women work in the public sector, even though the labor force participation of females in Nordic countries is relatively higher than other countries (Mandel & Semyonov, 2010).

2.2 The influence of firms

The significant number of studies regarding the influence of firms on female lifestyle choices has been accumulated. First, several studies address the decision making of firms on gender wage differences or on the female lifecycle. For example, some economic studies have examined

‘discrimination’ by employers toward female workers, which is called ‘statistical discrimination’ (Arrow, 1973; Phelps, 1972)². According to this theory, employers might discriminate against a group of workers, when they believe that group of people is inferior to another relatively speaking, with regard to qualification, productivity, or long-term employment. On the other hand, the ideas of self-fulfilling prophecy (Yamaguchi, 2010) and adverse selection (Gayle & Golan, 2012; Thomas, 2016) have been proposed as the counters to the theory of statistical discrimination. The former indicates that the lower productivity, qualifications, or the short-term employment of female workers are results of the expected unequal treatment by firms, while the latter shows that asymmetric information, in which employees know how hard they are working but employers do not, affects the decision of employers regarding wage, leave provision, and promotion. For instance, Yamaguchi (2010) showed, using a game theoretic model, that a self-fulfilling prophecy can occur in the following way: a lower commitment of women and a high turnover rate result from both the potential statistical discrimination and employers’ prejudice toward female workers productivity. On the other hand, the examples of adverse selection are shown in several research articles. Gayle & Golan (2012) argued that observed labor supply is the most important proxy of a gender wage gap, because employees might hide the information. Thomas (2016) stated that mandated maternity leave has an impact on decision-making process of firms in the sense that they provide more retention of work, but less prospect of promotion.

The influence of corporate policy, which balances work and life, is also discussed. Generous

² These studies address the unequal treatment toward a group of people, which is found in, for example, sexuality or race.

corporate policy of flexible working hours leads to a longer empowerment and a higher proportion of female managers, but there is a significant cross-national difference in the impact of the corporate policy (Kawaguchi, 2011). Moreover, Waldforgel, Higuchi, & Abe (1999) found, using a panel-data set, that leave coverage raises retention after a woman has a child. On the other hand, Eaton (2003) states that recognition and usability of employees on available policies is also an important factor to explain the mechanism of decision-making by female workers.

2.3 Women's Economic Contribution

The recent increase in the number of dual-earner couples has led to a growth in the debate regarding women's economic contribution,³ that is to say, women's relative earnings compared with their husbands. The study of women's economic contribution started with an article by Sørensen and McLanahan (1987), examining the changes in women's economic contribution over the 1940s to the 1980s in the United States. After that, there have been some studies on relative earnings within couples in the United States (Raley, Mattingly, & Bianchi, 2006), in European countries (Arber & Ginn, 1995; Van Berkel & De Graaf 1998; Ward, Dale, & Joshi, 1996) and in Japan (Sangu, 2002). Furthermore, there have recently been some cross-national studies, as a result of an increase in the availability of datasets (Bianchi, Casper & Peltola, 1999; Estévez-Abe & Hethey 2008; Stier & Mandel 2003, 2009).

According to these studies, the economic contribution of European and American women has

³ Some researchers refer to this issue as “economic dependency”. The terms vary according to assumptions regarding the role of women. In this thesis, I use the term, “economic contribution”.

increased over the years, even though women tend to depend on their husband's earnings. Moreover, some scholars have found that the number of women who earn more than men has also risen gradually in the United States (Winkler 2005; Winslow-Bone, 2006). However, Sangu (2002), replicating Sørensen's and McLanahan's study of 1987, found that the high economic dependency of Japanese women has not changed during the 1990s.

2.4 The lifestyle preference of female workers

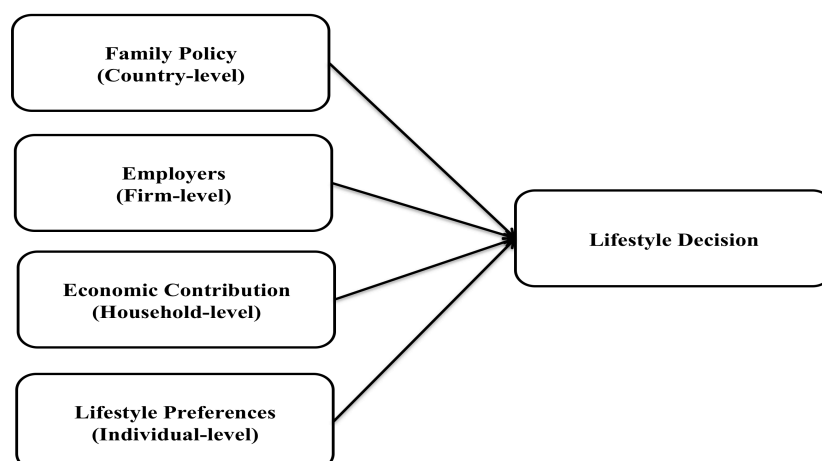
As was discussed in the introduction, life course choices for women have become more flexible in recent years. One possibility is to balance work and housework, while an alternative is to choose one or the other. With this increase in life course choices, the question is what do women really want? The main contribution to this issue is provided by Hakim's preference theory (Hakim, 2000), showing that there are three types of typical female preferences. According to this study, the minority of women falls into the work-oriented and home-centered categories, while the majority falls into the adaptive career category, combining paid work with childcare.

Although the preference theory has received attention from many researchers, there are also some critics of this work. For example, some studies argue that the female career decisions or satisfaction of life is determined by multi dimensional aspects, and it is important to consider their interrelation with each other (Blackburn, Browne, Brooks, & Jarman, 2002; Warren, 2004). In their view, the financial situation, leisure time, social policies, or the power of the employer should be taken into account when the female preferences are examined, because female life course is restricted by such factors.

Furthermore, as mentioned previously, a heterogeneity of women's life course decisions has been observed between countries. In addition, cross-national studies have shown the different relative earning contribution within couples from one country to another (Estévez-Abe & Hethey, 2008; Stier & Mandel, 2003, 2009).

In sum, previous studies have shown that female courses are determined by multiple level features – for instance, provision of family policy (country-level), the power of employers (firm-level), balance within the household (household-level), as well as their own lifestyle preferences (individual-level) (Figure 6). The lifestyle decisions include the choices of having a child, retention of work after taking care of a child, and reconcile work and life as a household.

Figure 6 The determinants of lifestyle decisions



In order to explain these broad topics more comprehensively, I will utilize the ‘game theoretic

model' for my primary methods, as this game theoretic model allows me to explain the mechanisms as well as the influential determinants of female life cycle decisions theoretically. In addition, laboratory experiments are conducted to investigate the variables, which are difficult to measure in the model. For instance, the variables, wage settings and productivity, are hard to estimate by a theoretic model – because these variables might be changed by the unexpected conditions such as the absence of workers. Therefore, there is a need to examine the effect of absence on decision-making of wage-settings and productivity by firms and female workers respectively.

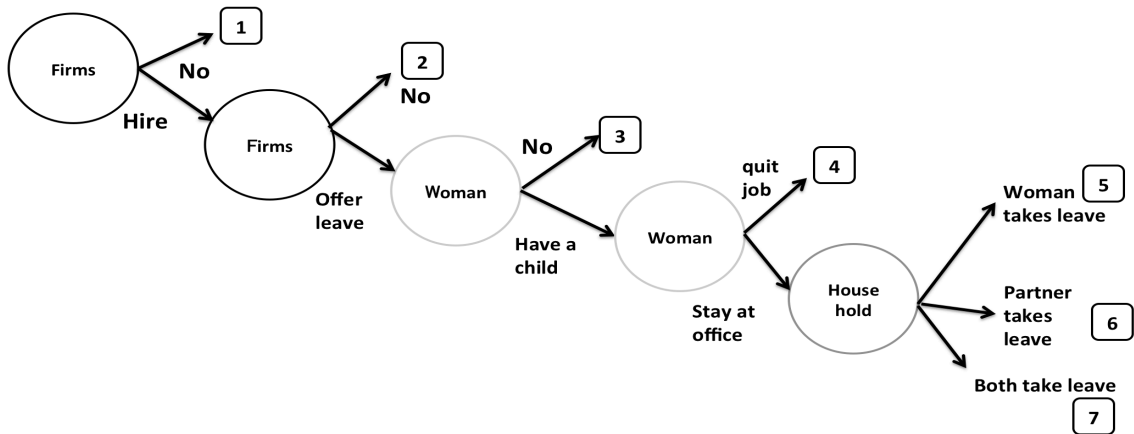
3. Game Theoretic Model

3.1 Model

As was discussed in the previous section, the main focus in my model is on the behaviors of firms and individuals rather than on the policy makers. In this section, I create a theoretic model using a game theoretic approach applied to a sequential game between employers and employees. The model will proceed from when an individual starts to work in a company, to when they decide how to earn income for the joint household.

Figure 7 shows a game theoretic model, which will be tested. In this model, a government is assumed as the vulnerable actor - that is to say that the government has no bargaining power in the decision process between firms and individuals. Moreover, I presume that firms and individuals are rational actors, namely, that companies maximize their profit and that individuals put an effort into maximizing the amount of household income with their partner. Lastly, individuals are assumed to be of the working-age population and having a partner, and one of them should take care of their child if they decide to have one. To make a simple assumption, the couple is considered to be heterosexual.

Figure 7 Game theoretic model



As Figure 7 shows, this game theoretic model is a sequential game. The individuals and the firms choose their decision paths one by one. In this model, first, firms decide whether to hire a person or not. Then, if a woman gets a position, the woman will choose if she has a child or not. Thirdly, firms should determine whether or not they will provide this woman with leave, under the provision of family policy provided by government. Therefore, the decision of firms is somewhat restricted by policy provision from government. After firms decide to offer leave or not, the woman decides to stay in the work place or to leave the office. If she chooses to leave the office, she will invest all of her time to take care of her child. Lastly, the woman decides to accept the offer of leave from firms if she stays the work place, considering the optimal household income. All decision of a woman will be conditioned by the wage of a partner. This model will be tested using a backward induction, “the method consists of going backward by steps, starting from the terminal nodes of the decision tree and proceeding a step at a time until the root is reached (Aliprantis & Chakrabarti, 2011, p.123)”. Therefore, the possible equilibrium will be shown considering all of the information sets of this decision tree.

Before the payoffs of each end will be explained, there is a need to describe the variables used in this model. First, the utility of the firms are denoted by productivity from a person (Φ) and the wage (w). In this model, Φ is the profit, while w is the cost for the firms. Therefore, the basic utility function of firms is simply: $\Phi - w$. This equation indicates that if the productivity of the person is higher than the wage, the firms get higher profit, whereas the higher they pay the higher the cost from their profits. Next, the lifestyle preference of women is described by the same logic as the utility function of the firms, using the emotional benefit from the child (B) and perceptual cost of it (C). Applying the benefit and the cost for the utility function of a woman, the utility of a child is : $B - C$. Eventually, the variables of family policy are shown such as time in leave (L), fine for firms' denying leave (F), replacement rate of leave (p), availability of childcare (ac), and cost of childcare (cc). All variables and the utility functions described in this paragraph are shown in Table 1:

Table 1 Variables and utility functions

Firms	Variable	Utility
Productivity of the person	Φ	$\Phi - w$
Wage	w	
Woman		
Benefit from a child	B	$B - C$
Cost of a child	C	
Family policy		
Time in leave	L	
Fine	F	
Replacement rate of childcare	p	
Availability of childcare	ac	
Cost of childcare	cc	

Along with the variables, the detail payoffs of each end of the decision tree are established as below.

To begin with, this game has three periods of time – the first period is from the time that a woman

gets a position to that in which a woman takes a leave, the second is the duration of a leave (δ), and last period is the time when a woman comes back to the office after she takes a leave (δ^2). These discount factors (δ, δ^2) are assumed to be less than one (>0) – this assumption is made by the expected impact of absence on the decision-making of firms and female workers, in the sense that absence might have negative image on the wage setting and productivity. Therefore, the more the periods proceed; the smaller the utilities of firms and women. Moreover, the future value is usually assumed to be less than present value because of inflation.

First, a firm decides whether to hire a woman or not. The first payoff (#1) of a firm and an individual are shown. If the firm decides Not to hire then:

$$(\text{Firm, Woman}) = (0,0)$$

Obviously, both a firm and a woman get no payoff because no contract has been made between actors. The second payoff is characterized as below, considering the fact that firms denied to offer leave to the employee (#2):

$$(\text{Firm, Woman}) = ((\Phi - w) - F, W)$$

The important factors are the F (the fine for not providing a leave to employee) and $B-C$ (the perceptual utility obtained from a child minus personal costs of caring for the child). First, the firm can gain the productivity of the female worker and pay the wage for the work. However, the second node describes the decision regarding allowing leave. The firm can choose to grant a leave or not. If the firm does not offer a mandatory leave, which is enacted by a government – then, the firm should pay fine for violation of the rule. On the other hand, the woman will obtain the wage continuously, as she does not have a child and continues to engage in paid work.

The third period describes the phase of choosing whether she wants to have a child or not. Here, the woman is assured to gain the paid leave, but she should choose one of the opinions between having a child or engaging in paid work continuously. If the woman decides not to have a child, the payoffs of this decision are presented as below (#3):

$$(Firm, Woman) = (\Phi - w, w)$$

In case a woman decides not to have a child, the gain of firm is determined by the utility function obtained by productivity and wage of the person, while the payoff of the woman is determined only by the wage.

In the case of her quitting, to devote her time to taking care of a newborn child, the utility functions of two actors would be (#4):

$$(Firm, Woman) = ((\Phi - w), w + (B - C))$$

As equations show, the firm will gain the productivity of the first period (that is, the period before she takes a leave), and pay the wage according to her work, whereas the woman obtains the wage in the first period, and the utility from taking care of the child.

Finally, the last payoff should be described. The last problem is: Who takes a leave if the firm offers a leave to individuals? Firstly, the utility function of the firm is shown (#5 through 7):

$$Firm = (\Phi - w) + \delta L(0) + \delta^2 [ac (\Phi - w) + (1 - ac) (0)]$$

The discount factor (δ) indicates the periods of time explicitly. The first period without discount factor describes the utility of firm before the woman takes a leave. During the period, the firm will

obtain gain from the productivity of a woman and pay wage as a cost. The second period (δ) shows the time in leave, the firm will gain nothing since subsidies goes to a woman directly from government. Last period (δ^2) shows the time after she gets back to the office. The firm obtains again the gain from the woman, if she gets childcare services, otherwise the firm obtains nothing since the woman has to leave the office to take care of a child. On the other hand, the utility function of the household is described (#5 through 7):

$$\text{Woman} = (w) + \delta L[p * w + (B - C)] + \delta^2 [ac(w - cc) + (1-ac)(B-C)]$$

The indication of discount factors is the same as the case of the firm. During the first period, before she takes a leave, the woman obtain utility from the work, namely, wage at work. Secondly, while a woman takes a leave (δ), she will obtain replaced wage, which is determined by law. In addition, the utility of a child should be considered, since the woman has a role of a caretaker. Lastly, she will obtain the wage from work and pay the cost of childcare if she gets it, while she gains the utility of a child if she does not obtain any childcare (δ^2).

Table 2 shows the payoff of each end described above. In next section, this model will be tested in general.

Table 2 The summary of payoffs

Number	Firm	Woman
1	0	0
2	$(\Phi - w_f) - F$	w_f
3	$\Phi - w_f$	w_f
4	$\Phi - w_f$	$w_f + (B - C)$
5		
6	$(\Phi - w_f) + \delta L(0) + \delta^2 [ac(\Phi - w_f) + (1-ac)(0)]$	$(w_f) + \delta [p * w_f + (B - C)] + \delta^2 [ac(w_f - cc) + (1-ac)(B - C)]$
7		

3.2 Model testing

In this section, the results of the game theoretic model are obtained by backward induction, and will be described by the abstract variables.

Using backward induction, the equilibrium of the model will be detected. First, the household decides who take(s) leave. Comparing the options among: father takes leave, mother takes leave, and both take leave, the household will choose one of them. Assume w_m (m=male) $>$ w_f (m=female)⁴, household will choose “both take leave” if:

$$\begin{aligned}
 & (w_f) + \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc) + (1-ac)(B_f - C_f)] + w_m \\
 & < (w_f) + \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc) + (1-ac)(B_f - C_f)] + (w_m) + \delta L[p * w_m + \\
 & \quad (B_m - C_m)] + \delta^2 [(w_m)] \\
 & \Leftrightarrow \\
 & (C_m * L) < L(p * w_m + B_m) + \delta(w_m)
 \end{aligned}$$

Thus, if the cost of a child for father during leave is smaller than the gain from replaced wage of father, the benefit from a child, and the wage after he takes a leave, the father also takes leave. Otherwise, only the mother takes a leave to take care of a child. The full household decisions are described in Table 3.

⁴ As is shown in studies, the wage of female worker is lower than male workers in general (OECD, 2017). Moreover, chapter 1 showed the majority of income structure of households is that women rely on the spouse income in many countries.

Table 3 Who take(s) leave (#5 to #7)

	$w_f < w_m$		$w_m < w_f$
$L(p * w_m + B_m) + \delta(w_m) < (C_m * L)$	Mother takes a leave	$(p * w_f + B_f) + \delta(w_f) < (C_f * L)$	Father takes a leave
$(C_m * L) < L(p * w_m + B_m) + \delta(w_m)$	Both take leaves	$(C_f * L) < (p * w_f + B_f) + \delta(w_f)$	Both take leaves

Secondly, the decision of a woman between staying in an office and quitting a job is assessed below. Comparing the options between quitting a job and taking maternity and childcare leave, the woman will choose to be continuously employed in the office when:

$$\begin{aligned}
 & w_f + (B_f - C_f) < \\
 & (w_f) + \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc) + (1 - ac)(B_f - C_f)] \\
 & \Leftrightarrow \\
 & (B_f - C_f) < \\
 & \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc + C_f - B_f) + (B_f - C_f)]
 \end{aligned}$$

If the equation is differentiated by ac (=availability of childcare):

$$\begin{aligned}
 & 0 < \delta^2 (w_f - cc + C_f - B_f) \\
 & \Leftrightarrow B_f - C_f < w_f - cc
 \end{aligned}$$

The interpretation of this equation is the following. One unit of the increase in probability to get the childcare raises the intention of woman to stay at the office, in case monetary benefit is bigger than emotional gain from a child. On the other way around, the one unit of the increase in availability of childcare raises the intention of woman to leave office, only if the gain from child is greater than

monetary gain. The same procedures make it possible to understand the rational comparisons of choices between taking a leave and the woman quitting her job⁵.

$$\begin{aligned}
& w_f + (B_f - C_f) < \\
& (w_f) + \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc) + (1-ac)(B_f - C_f)] + \delta L[p * w_m + (B_m - \\
& C_m)] + \delta^2 [w_m] \\
& \Leftrightarrow (B_f - C_f) < \\
& L[p * w_f + (B_f - C_f)] + \delta [ac(w_f - cc + C_f - B_f) + (B_f - C_f)] + \delta [w_m]
\end{aligned}$$

This equation can be differentiated by the availability of childcare as follows:

$$\begin{aligned}
0 & < \delta(w_f - cc + C_f - B_f) \\
& \Leftrightarrow B_f - C_f < w_f - cc
\end{aligned}$$

As the equation indicates, the household chooses the option that both take leave during taking care of a child, rather than the woman quits job, in the case that the monetary gain is enough when it comes to comparison of the benefit from a child. This equation is the same as the comparison between only mother's taking a leave and quitting a job.

The summary of comparison in choices between quitting a job and staying employed is shown in Table 4:

⁵ The cost of childcare is counted once, as it would be paid once by a unit of household. Moreover, I assumed here husband's wage is higher than wife, thus household chooses women quit job in case the childcare service is not available.

Table 4 The choice between quitting a job and staying employed

(a) In case mother takes a leave:

The increase in the probability to get the childcare indicates:

$W_f - cc < B_f - C_f$	$B_f - C_f < W_f - cc$
Quit a job	Stay in the office and take a leave

(b) In case both parents take a leave:

The increase in the probability to get the childcare indicates:

$W_f - cc < B_f - C_f$	$B_f - C_f < W_f - cc$
Quit a job	Stay in the office and take a leave

Next, the decision between having a child or not is tested below. The choices of women are tested in the following ways. First, the choices between not having a child and quitting the work place are compared as below:

$$w_f + (B_f - C_f) < w_f$$

$$\Leftrightarrow (B_f - C_f) < 0$$

$$\Leftrightarrow B_f < C_f$$

Therefore, obviously, the women will continue to work without a child, in case she feels negative utility from having a child rather than positive feelings.

Then the woman compares the options between not having a child and having a child, but taking

some leave for taking care of a child:

$$\begin{aligned}
w_f &< (w_f) + \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc) + (1-ac)(B_f - C_f)] \\
&\Leftrightarrow 0 < [p * w_f + (B_f - C_f)] + \delta [ac(w_f - cc) + (1-ac)(B_f - C_f)] \\
&\Leftrightarrow 0 < [p * w_f + (B_f - C_f)] + ac[\delta(w_f - cc - B_f + C_f)]
\end{aligned}$$

This equation can be differentiated by the availability of childcare as follows:

$$\begin{aligned}
0 &< \delta(w_f - cc - B_f + C_f) \\
&\Leftrightarrow B_f - C_f < w_f - cc
\end{aligned}$$

Hence, an increase in an availability of childcare creates a comparison between emotional gain of the women from a child and monetary conditions. In case, the woman feels the wage minus the cost of childcare is better than taking care of a child for her entire life, then she will decide to have a child and come back to the office after the period of leave is done. This equation is also applied in the case of ‘only father will take a leave’ in the way the comparison of choices is found in wage and emotional gain of father. Then, what happens if the both take the leave? The utilities between not having a child and having a child and both taking leave are compared as follows⁶:

$$\begin{aligned}
w_f &< (w_f) + \delta L[p * w_f + (B_f - C_f)] + \delta^2 [ac(w_f - cc) + (1-ac)(B_f - C_f)] \\
&\quad + \delta L[p * w_m + (B_m - C_m)] + \delta^2 [(w_m)] \\
&\Leftrightarrow 0 < [p * w_f + (B_f - C_f)] + ac * \delta[(w_f - cc) - (B_f - C_f) + \delta[w_m]]
\end{aligned}$$

This equation can also be differentiated by the availability of childcare as follows:

$$0 < \delta[(w_f - cc) - (B_f - C_f)]$$

⁶ The same assumption of household income structure was applied as in Table 4.

$$\Leftrightarrow B_f - C_f < w_f - cc$$

Therefore, if I assume that the male wage is higher than the female, the choices between having a child and not having a child are a trade-off between emotional gain from a child and economic incentive of the wife's wage. Moreover, it is importantly to note that this decision is subject to the increase in available childcare services. The comparison in the utility functions between having a child and not having a child are shown in Table 5.

Table 5 The choices between having a child and not

(a) In case mother or parents decide(s) to take a leave for a child:

An increase in the probability to get the childcare indicates:

$w_f - cc < B_f - C_f$	$B_f - C_f < w_f - cc$
Not having a child	Having a hild

(b) In case mother decides to quit the job for a child:

$B_f < C_f$	$B_f < C_f$
having a child	not having a child

Since the strategies of a woman and a household are ready, it is turn for a firm to decide to offer a leave to this woman or not. First, in the case in which a woman chooses to quit the office, how does the firm react? The firm does not offer leave only if:

$$(\Phi - w_f) < (\Phi - w_f) - F$$

$$\Leftrightarrow 0 < F$$

This is an obvious result in the sense that paying a fine is worse if a woman will certainly quit her job. Then, what if the woman decides to stay in an office and take a leave? The firm does not offer a leave in case:

$$(\Phi - w_f) + 0 + \delta^2 * ac * (\Phi - w_f) < (\Phi - w_f) - F$$

This equation can be differentiated by availability of childcare:

$$\delta^2 (\Phi - w_f) < 0 \Leftrightarrow \Phi < w_f$$

Thus, an increase in the unit of childcare raises the utility for not offering a leave, only if the wage is greater than the productivity, that is, the woman is too costly to keep in the company. On the other hand, the increase in the unit of availability of childcare raises the utility from offering a leave to a woman, only if the productivity is greater than the cost for the firm.

Table 6 The choices between offering a leave and not

(a) In case a women will stay at an office ($B_f - C_f < w_f - cc$):

An increase in the probability to get the childcare indicates:

$W < \Phi$	$\Phi < W$
Offering leave	Not offering leave

(b) In case a women will leave an office ($w_f - cc < B_f - C_f$):

$0 < F$	$F < 0$
Offering leave	Not offering leave

Lastly, the firm will choose the options between hiring a woman and not hiring a woman. At first, in case the woman does not want to have a child, the firm will decide to hire the person if:

$$0 < \Phi - w \Leftrightarrow w < \Phi$$

the productivity of the person is bigger than the wage. This is the same result as that if the woman wants to quite the job, although the firm offers a leave. In case that the firm will not offer a leave, the firm will hire the person only if:

$$0 < (\Phi - w) - F \Leftrightarrow w + F < \Phi$$

The productivity of the person is greater than the sum of the wage and fine. Furthermore, what if the person will take a leave when she has a child, and is willing to come back to the office? If this is the case, the firm will hire her if:

$$0 < (\Phi - w) + 0 + \delta^2 ac(\Phi - w)$$

$$\Leftrightarrow w + \delta^2 * ac * w < \Phi + \delta^2 * ac * \Phi$$

$$\Leftrightarrow w(1 - \delta^2 ac) < \Phi(1 - \delta^2 ac)$$

$$\Leftrightarrow w < \Phi$$

Table 7 The choices between hiring a woman and not

(a) In case the woman does not have a child:

$W < \Phi$	$\Phi < W$
Hire	Not hire

(b) In case the firm does not offer leave but women want to have a child:

$W + F < \Phi$	$\Phi < W + F$
Hire	Not hire

(c) In case the firm will offer a leave:

$W < \Phi$	$\Phi < W$
Hire	Not hire

Therefore, it could be concluded that according to the model, the person is evaluated by productivity and wage in phase of hiring.

3.3 Discussion

In this chapter, I have explained the mechanism for how a firm and a woman decide about the provision of family policy as well as a lifestyle of household and a female worker. The previous sections clearly showed the fact that both lifestyle choices and career decision of firms are determined by multiple factors, not only the policy provision, but also the individual features affect their choices. In order to summarize the findings of this model, I would like to discuss the results of the game theoretic model.

First, the conditions of decision-making predicted by backward induction are shown as follows. In order to compare the equations and decision-making tree, I recall, at first, the Figure 7 and show Table 8 below.

Figure 7 Game theoretic model

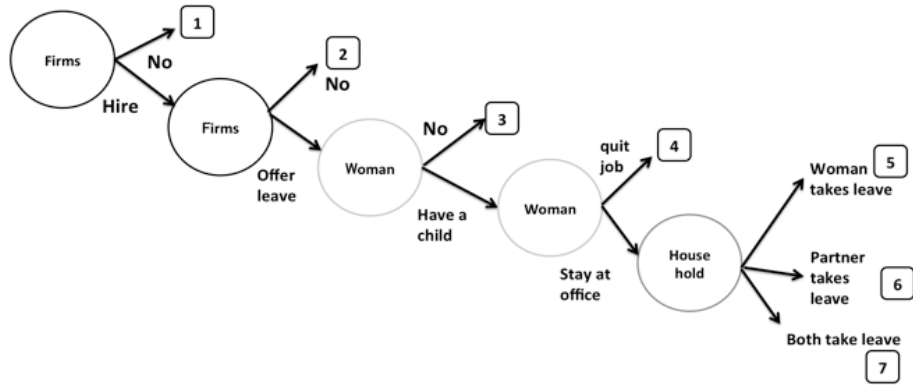


Table 8 The summary of conditions

Number	Condition
1	(a) In case the woman does not have a child:
	$\Phi < w$
	(b) In case the firm does not offer leave but women want to have a child:
	$\Phi < w + F$
	(c) In case the firm will offer a leave:
	$\Phi < w$
2	(a) In case the woman will stay at an office: ($B_f - C_f < w_f - cc$)
	The increase in the prob. to get the childcare indicates: $\Phi < w$
	(b) In case the woman will leave an office: ($w_f - cc < B_f - C_f$)
	$F < 0$
3	(a) In case a women mother or parents decide(s) to take a leave: ($B_f - C_f < w_f - cc$)
	The increase in the prob. to get the childcare indicates: $w_f - cc < B_f - C_f$
	(b) In case a women want to quite the job: ($w_f - cc < B_f - C_f$)
	$B_f < C_f$
4	The increase in the prob. to get the childcare indicates: $w_f - cc < B_f - C_f$
5	$(C_m * L) > L(p * w_m + B_m) + \delta(w_m)$
6	$(C_f * L) > L(p * w_f + B_f) + \delta(w_f)$
7	$L(p * w_m + B_m) + \delta(w_m) > (C_m * L)$
	$L(p * w_f + B_f) + \delta(w_f) > (C_f * L)$

These results of the backward induction show several important features that should be noted. First, gender wage differences in the labor market (w_m , w_f), length of leave and replacement rate during a leave period (p) affect the lifestyle choices within households strongly. Wage difference has an impact on the decision of ‘who take(s) leave’ – the caretakers might be mostly female, considering the fact that most countries have the wage differences as wage of male is higher than that of female (OECD, 2017). The length of leave also affects the choices of a caretaker within households, in the way that the length of leave strengthens both benefit and cost of a child. Therefore, those who prefer to take care of a child would more likely to choose the option of taking care of a child rather than giving a right of care to the partner. If the person feel negative emotions from leaving work and caring for a child rather than positive ones, then the person will really want to come back to the office as length of a leave gets longer. Moreover, if the male wage is higher than the female one, the high replacement of the father provides a more equal gender role within households. If the sum of salaries during leave, as well as the expected wage, which is decided after the leave periods end, are higher than the cost of caring for a child for the father, then that leads to more participation in childcare. Secondly, the cost and availability of childcare facilities (ac , cc) are the most important factors when it comes to the decisions of having a child, and staying the office after the care leave period ends. For instance, the equations in number four in Table 8 show that a low cost of childcare increases the female workers’ coming back to the office. Furthermore, the availability of childcare affects the decisions regarding having a child and future employment after a leave – in the sense that if availability of childcare is low or the cost is high, it tends to be the case that women make decisions that differ from their preferences. Furthermore, meeting the demand of childcare leads to

the fair evaluation of workers by firms – if the productivity of the worker is higher than the wage of the person, firms will provide the leave properly. Lastly, the fine has an impact on the phase of recruitment, as the firms would consider women, who potentially will leave the office, as too costly in the case of a leave. In this case, the firms do not want to offer a leave. In this model, the information set is shared for both actors, but those firms, which do not want to provide a paid leave, might discriminate against female rather than the male workers in cases in which they do not have the information regarding whether or not a woman plans to have a child.

However, I assumed, at first, that future value of productivity and wage are diminishing by the absence of work – the discount factor described that the value during the leave and after a leave are much less than that of the present value. In order to relax this assumption, the next chapter will address the productivity of the persons and wage setting by firms, utilizing a laboratory experiment.

4. Laboratory experiment

A laboratory experiment was utilized to examine the effects of absence on the productivity of employees as well as the wage settings of employers. This experiment was a variation on the classic gift-exchange framework (Akerlof, 1982; Akerlof, 1984; Fehr, Kirchsteiger, & Riedl, 1998). In the original experiment, ‘reciprocity’ has been observed if the firms offer more than a minimum wage (a gift), and the worker replies by choosing a higher performance level (reciprocity).

This reciprocal behavior has been observed in many different settings of market conditions. For instance, in a non-competitive market, in which the number of sellers exceeds that of buyers, a higher wage led to higher effort levels (Fehr, Kirchler, Weichbold and Gächter, 1998). Moreover, reciprocal was also observed in a competitive market, where the number of buyers and sellers are the same (Fehr et al., 1998). Moreover, some studies mentioned the influence of minimum wage – a minimum wage increases the standard of wages, but is prone to be met by lower effort levels due to change in expectations of the standard of wages (Brandts & Charness, 2004). Mori (2013) introduced the possibility of a ‘lay-off’ in the market with a minimum wage setting – and found out that the low effort level is moderated by the possibility of getting fired, in the sense that workers do not change effort levels, or reply with higher effort levels, because of a fear of lay-off. In sum, ‘reciprocity’ has been observed in many different conditions of the market – competitive, non-competitive, minimum wage and sick leave - and this result is robust in any conditions.

This experiment was conducted to examine the impact of absence on the reciprocate behavior, by

excluding some subjects out of the game for a few rounds. Similar work was done in a paper on mandatory sick leave provision by Bauernschuster, Duersch, Oechssler, & Vadovic (2010) – this study tested the effects of sick leave on the behaviors of moral hazard⁷ and adverse selection⁸ by workers. According to the study, mandated sick leave had an effect in diminishing the adverse selection (although those who have the potential to leave tend to chose a firm with higher replacement), while the mandated replacement rate brought reciprocal behavior if the no minimum level was decided.

In my experiment, attention was paid to the employers' decisions rather than worker's behaviors of adverse selection or moral hazard. I investigated how the absence of some employees would affect the their future wage? There is a great possibility that the absence of women introduces endogeneity into this process. Firms might consider female workers who take family leave to be less productive and accordingly set wages lower. Moreover, the employers' decisions might have an effect on productivity of employers sequentially - a woman might contribute more to compensate for the lower wage or she might reduce her productivity. In any case, productivity and wages are hard to measure without sufficient controls. A laboratory experiment is an appropriate method to observe the motivations driving individuals' choices in a controlled setting. In the following sections, I will describe procedure and results of my experiments.

⁷ The workers were allowed to skip work in this experiment, but employers did not know the reasons why employees' productivity level was zero. Thus, moral hazard in this game describes the situation that employees do not reply any effort as pretending taking sick leave.

⁸ In this case, adverse selection indicates that workers tend to choose a firm offering higher sick-pay.

4.1 Experimental procedures

This experiment was built upon the gift-exchange experimental foundation by excluding some subjects for one or two (out of four) rounds of game. This setting allowed me to understand how leave policy affects the decision-making of individuals relative to the firm. The game was subject to a repeated game format – this setting allowed subjects to build trust between themselves and their counterpart (employer/employee), and more importantly, it described long-term contracts. According to Gächter & Falk (2002), repeated games observed stronger and steeper ‘reciprocity’ behavior than repeated one-shot games. Moreover, partners were anonymously paired, and the information of the partner was not revealed to the subjects, because Seinen & Schram (2001) found that the information given by experimenters would change the decisions of subjects.

Subjects were drawn from students at the University of Tampere and Tampere University of Applied Sciences in Finland. International students were excluded from the participant pool in order to control for cultural background factors. The subjects were assigned the role of either a firm or a worker. They were randomly paired and the pairs stayed fixed for the duration of the game. The number of students was 36, and half of the students played a role of firms, while others were workers.

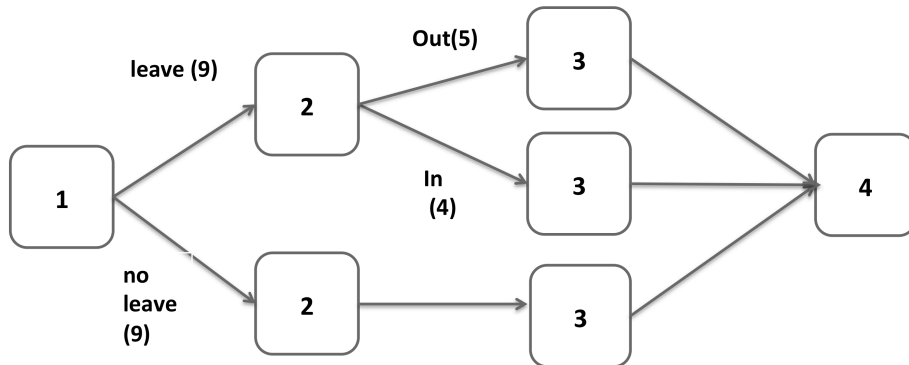
The experimental procedure was as follows. In the first round, firms set the wage $w=\{1, 2\ldots 10\}$, then employees decided on the quality of work $\Phi=\{0, 1, 2\ldots 10\}$. This was the basic procedure for all rounds. In each round, the payoff was calculated by following equations:

$$(\text{firms})=3*\Phi-w, \text{ and } (\text{employees})= w-1/4*\Phi$$

Thus choosing a higher wage or more effort led to an increase in payoff for the other player, but it was costly at the same time. I included two treatment groups to observe the effects of leave. First, nine workers were forced to take a leave in the second round. This leave was communicated to these workers and their respective employers by giving each of the workers a card which stated that they would have to take a break for that round, and that they would receive half of the pay for the previous round but would make no effort for the round. The respective employers received a card stating that their employee had to take a break for the round, and that they must pay half of the wage from the previous round. In this case, workers obtained only 50% of the wages decided in the first stage, whereas firms got zero productivity. This was similar to the laws of maternity/ paternity/ parental leave that employers should pay salary subject to replacement rate.

Second, five workers among those who took the leave were unable to participate again in the third round. They each received cards stating that they would again take a break, but this time the break would be without compensation. The employers received similar cards. Those 10 players (employers and employees) got no payoff in this round, but other pairs chose wage and effort levels as they did in the first round. The third round was meant to replicate potential problems with the availability of childcare – in a real-world context, some players are entirely excluded in the third round, because they could not find a facility in which they could put their children, while others found a childcare facility during the working hours. The summary of treatments was shown in Figure 8.

Figure 8 Treatment/ Control groups



The payment was calculated by:

$$1/2 * (\text{points in the game}) + 5\text{€}^9$$

4.2 Hypotheses

What are the possible hypotheses? Considering the decision-making process between employers and employees, there is a great possibility for reciprocity to be observed in this game – that is, the provision of a higher wage by employers leads to the higher effort level chosen by employees. This reciprocal behavior is observed in many contexts (Bauernschuster, Duersch, Oechssler, & Vadovic, 2010; Fehr, Kirchler, Weichbold, & Gächter, 1998; Mori, 2013). Moreover, this relationship is stronger and steeper in the conditions of a repeated game rather than in a one-shot game (Gächter & Falk, 2002). The repeated 5 round game is likely to bring reciprocal interactions and the effect of reciprocal behavior is likely to be stronger and steeper round by round. Hence, the first hypotheses regarding ‘reciprocity’ are stated as follows:

⁹ The minimum payment was 5 euros for a show-up fee. In case participants earned less than 0, then the persons kept show-up fee. Moreover, maximum payment was restricted to 25 euros.

H₁₋₁: In both groups, control and treatment groups, reciprocity is observed

H₁₋₂: This reciprocal behavior will be stronger as the game proceeds

The main interest in this experiment is – the impact of ‘absence’ on the decision-making process between firms and workers. What are the expected results, in case the absence of workers suddenly happens? As the section of ‘influence of firms’ showed, the negative evaluations toward female workers are addressed mainly by three different perspectives – statistical discrimination (Arrow, 1973; Phelps, 1972), self-fulfilling prophecy (Yamaguchi, 2010), and adverse selection (Gayle & Golan, 2012; Thomas, 2016). The theory of statistical discrimination occurs by the discriminating behavior toward female workers, when employers consider that the productivity of female worker is inferior to male workers. On the other hand, the notions of self-fulfilling prophecy and adverse selection addressed this issue through different perspectives – the former indicates that the low productivity of female employees is brought by the expected unequal treatment from employers, while the latter shows that adverse selection occurs because of hidden information of employees, such as preference between leisure time and work, and unpredictable absence.

In those theories, a premise that employers discriminate against female workers is observed, due to expected lower productivity and unpredictable absence of ‘female’ workers. Then, what occurs in case this frame of ‘gender’ is taken away? In my experiment, the subjects were randomly chosen for a role of either an employer or an employee regardless of their sex. Moreover, the information of the partners was not revealed to the participants. Therefore, the frame of gender is completely removed, and it would indicate that the ‘absence’ is the main reason of the gender unequal

treatment by employers.

The following hypotheses are established to examine the impact of absence on the interactive decisions between employers and employees:

H₂₋₁: The absence of workers affects the decisions of employers and employees negatively

H₂₋₂: The increase in provision of wage and effort level is steeper in control group (non-leave group), rather than treatment group (leave groups)

4.3 Results

First, the hypotheses regarding reciprocate behaviors (H₁₋₁ and H₁₋₂) are examined. The data of treatment one in round two and treatment two in round two / three are excluded, due to treatments, which were arbitrary determined by author. Because the interests of hypotheses H₁₋₁ and H₁₋₂ are found in the relationship between wage and effort, long-data (merged data of all rounds of decisions) is utilized for analysis. The summary statistics of data used in the analysis is shown as below.

Table 9 Summary statistics (long-data)

	N	Mean	S. D.	Min	Max
Pooled					
wage	76	6.92	2.51	1	10
effort	76	4.84	2.86	0	10
Treatment groups					
wage	31	7.06	2.45	2	10
effort	31	4.65	2.86	0	9
Control group					
wage	45	6.82	2.58	1	10
effort	45	4.98	2.88	0	10

First, the rank-correlation between the level of work and wage is examined. The pooled data, which

includes treatment and control groups, indicates $\rho=0.81$ ($p=.00$, $N=76$) – which proves that the strong correlation between wage and effort level is observed in general. This correlation is observed in separated data, control and treatments groups, as $\rho=.80$ ($p=.00$, $N=31$) and $\rho=.82$ ($p=.00$, $N=45$) respectively. Therefore, H_{1-1} : *In both groups, control and treatment groups, ‘reciprocity’ is observed* is supported by the wage-effort relationship.

Although the wage and effort level are significantly correlated, this correlation does not explain the causality of two variables. Because the game proceeds from employers’ offering wage to employees’ replying effort level, a regression model is established as follows:

$$(\text{effort level}) = \alpha + \beta(\text{wage}) + \beta(\text{round}) + \varepsilon$$

where α is intercept, β are slope of independent variable(s), and ε indicates an error term. The results of the regression model are shown in table 10.

Table 10 Regression on effort level

	Pooled data			Treatment groups			Control group		
Independent var.	Coef.	S.E.		Coef.	S.E.		Coef.	S.E.	
Wage	.92	.083	**	.92	.14	**	.92	.10	**
Round	-.092	.14		-.018	.20		-.15	.19	
Intercept	-1.22	.66	†	-1.83	1.08		-.85	.84	
N	76			31			45		
R-square	0.63			0.62			0.66		
Adjusted R-square	0.62			0.60			0.64		

** $p<.01$, * $p<.05$, † $p<.10$ (Two sided test)

As the previous studies have shown, reciprocal behavior is observed in results of regressions in Table 10. All models (pooled data, treatment groups, control groups) clearly show that an increase in one unit of wage leads to the higher effort level. Thus, hypothesis H_{1-1} is significantly supported not only by rank-correlation, but also by regression model. However, H_{1-2} : *Reciprocal behavior will*

be stronger when the game proceeds was not supported by the regression models above – as the results of regression indicate that an unit of increase in rounds have no effect on effort level.

Next, the hypotheses from H_{2-1} to H_{2-2} are examined as follows. These hypotheses address the impact of absence on wage and productivity over time – therefore, the changes of their choices over rounds must be tested. Hence, the data has changed from long to wide, namely, data must contain the information of choices over time that are decided by pairs. The summary statistics of wide data is shown in table 11.

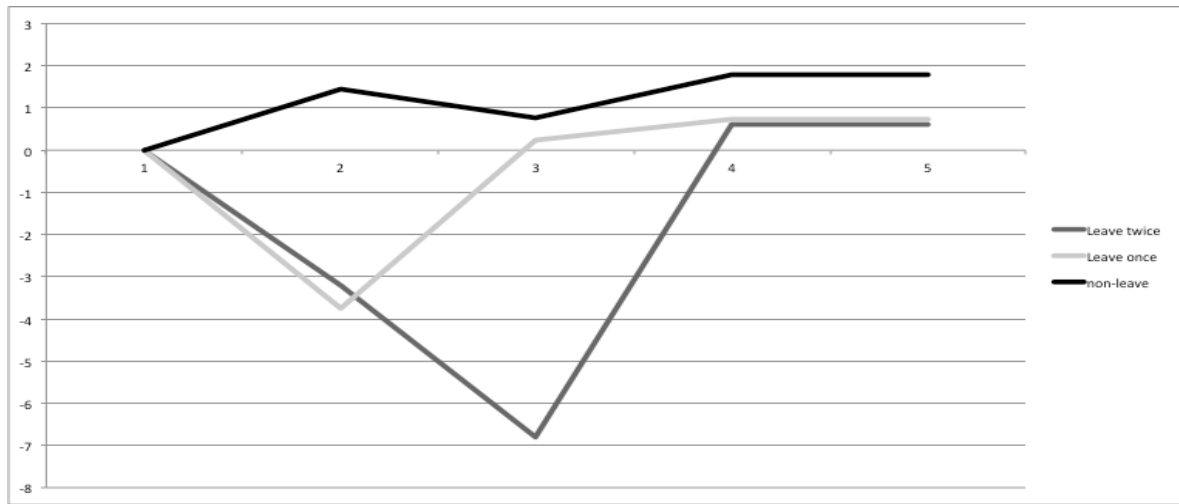
Table 11 Summary statistics (wide-data)¹⁰

	N	Mean	S. D.	Min	Max
Provision of wage					
R-1	18	6.39	2.38	3	10
R-2		5.39	2.50	2	10
R-3		4.94	3.83	0	10
R-4		7.61	2.33	1	10
R-5		7.61	2.50	1	10
Effort-level					
R-1	18	4.61	2.50	2	10
R-2		2.67	3.43	0	10
R-3		3.78	3.14	0	10
R-4		5.56	2.28	0	10
R-5		5.11	3.22	0	10

First, the provisions of wage by employers are examined. The relative transition of wage provisions from the first round to five rounds is shown in Figure 9. It shows the relative transition of wage over rounds as the initial wage provided by employers is set at zero. Minus values are observed, due to the conditions of treatment groups.

¹⁰ The data in this table includes the answers of treatment groups.

Figure 9 The relative shifts in the wage provisions

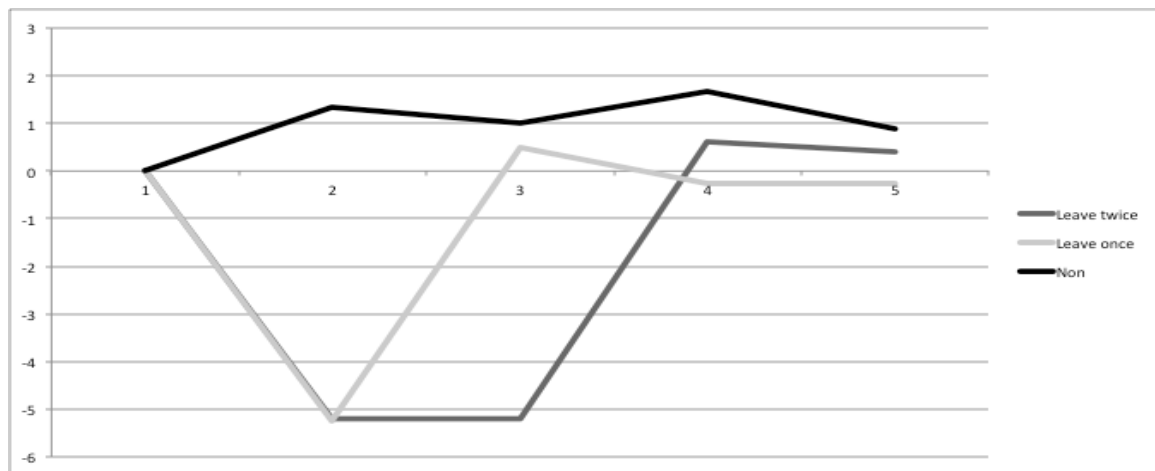


As can be seen, an increase in the provision of wages is found in all groups, but clear differences are found between treatment and control groups. Almost two units of changes in wage are observed in non-leave groups, while the less than one unit of raising wage is found in treatment groups. Therefore, H_{2-1} : *The absence of workers affects their decisions negatively* was not supported by the data from the experiment, as the increase in provisions of wage was round both in treatment and control groups. Although these differences between treatment groups and control group are not supported by t-test examination, the difference between them is sufficiently large as non-treatment groups increased almost two units (=1.78), while treatment groups increased less than one unit (0.6, 0.75 in average). Thus, H_{2-2} : *The increase in provision of wage and effort level is steeper in control group (non-leave group), rather than treatment group (leave groups)* is partially supported, in the case of provision of wages. Additionally, it should be noted that although one of the treatment groups was excluded twice out of five rounds, the increase in wages from the initial wage is almost the same as in another treatment group. The differences between treatment groups are not

significantly large and the average changes from the first to fifth rounds are the same in two groups (=0). Moreover, the change in round four and five in non-treatment group also has flat change as they are in treatment groups – it might be caused by the prediction of the end of games by subjects, as the answer sheets had only 6 rounds' boxes for their choices.

Although employers increase the wage in all the groups, decisions of employees appeared differently. Figure 10 shows the shifts of choices made by employees.

Figure 10 The relative changes in the choices of effort levels



As in the choices of employers, non-leave group chose relatively higher numbers than leave groups. However, the numbers of all groups fluctuated, especially in the treatment groups, which had leave period(s). Interestingly, the average scores of productivity right after the leave period(s) were higher than the initial effort levels, but the mean of effort levels decreases from those points. Moreover, one of the treatment groups even marked a lower score than the initial effort in the last round. In sum, the first hypothesis: H_{2-1} : *The absence of workers affects their decisions negatively* is partially supported by the choices of effort level, as one of the treatment groups chose lower effort levels

than their initial points. Furthermore, H_{2-2} : *The increase in provision of wage and effort level is steeper in control group (non-leave group), rather than treatment group (leave groups)* is clearly found as average scores of effort level in treatment groups is significantly higher than in the control group. However, it should be noted that these negative numbers might be stimulated from the small increase in the provisions of wage, as the reciprocal behaviors were supported by correlations and regression models.

5. Discussion

In this thesis, the lifecycle decisions of female workers were discussed by two different approaches, one is game theoretic model and another is through a laboratory experiment. In both cases, the life course decisions of women are examined with a consideration of the influence of firms. The game theoretic model addressed the women's decisions of having a child and balancing between family life and work with the considerations of available family policy and the resource allocations with their spouses. The influence of firms was considered by the construction of a sequential-game between female a worker and a firm. This model allowed me to detect the determinants of life course decisions made by women and the implement of policy that is decided by firms. In this way, the effective policy to support the employment of women, who would like to balance a family life and paid-work, would be logically considered. In addition, the laboratory experiment examined the impact of absence on interactive decision-making between employers and employees – what happens if the employees take a leave suddenly? What if the employees cannot find a childcare facility, which would take care of their child? The examination of the absence caused by the leave period is important, as female workers certainly have a leave period physically when she gives a birth. In the experiment, both employees and employers were not notified beforehand when workers would take a leave. Furthermore, the participants were randomly assigned into the roles of either employers or employees. Therefore, any change in wage/effort was considered a pure effect of the impact of absence regardless of the background of actors. If the absence of work affects the interactive decision-making between employers and employees, the government (or firm) should create the policy to make the length of absence equal between male and female workers, so that it promotes a gender equal society.

The game theoretic model highlighted some interesting determinants of lifecycle decisions of female workers. First, the influence of availability and cost of childcare are crucial factors when it comes to decisions regarding the choice to have a child and the potential for future employment after a leave. An increase in available childcare leads to increased participation of female workers in the labor force in case in which women want to balance paid and unpaid work. Moreover, the cost of childcare matters greatly – if the cost is too high, women tend to make need-based decisions that are different from their ideal outcomes. A father's participation in taking care of a child can be increased by narrowing the wage gap between male and female workers in the labor market, or in raising the replacement rate of paternity leave. The length of leave also has a great impact on both the benefit and cost of a child, thus it allows the person to engage in a role of caretaker, in the case in which the length of leave is longer. At the same time, a long leave provision would discourage the person to join in the child care, if (s)he sees childcare as a burden. A fine for not offering a mandatory leave affects decision-making in the phase of hiring the person, in the sense that for any firms which decides to violate the rule of leave policy, it is too costly to hire the female workers who will potentially quit their jobs in the future. The theoretic model described all the information sets held by the actors. Discriminatory behavior against female workers might occur, in cases in which the information is uncertain.¹¹

In order to test the impact of absence on the provisions of wage and effort-level, the laboratory

¹¹ The game theoretic model in this thesis did not test this case. This uncertainty should be considered in the future research.

experiment was utilized. The settings of laboratory experiment allowed me to examine the motivation behind the decisions of wage settings and productivity. The laboratory experiment was designed based on the classic gift-exchange frameworks (Akerlof, 1982; Akerlof, 1984; Fehr, Kirchsteiger, & Riedl, 1998) and the difference between previous studies and my thesis is found in the settings of treatment groups. In my experiment, some of the employees were arbitrarily excluded from the game, in order to see the effect of a sudden leave on interactive decision-making between firms and women. The pairs of employers and employees were not changed during the entire game, so that this setting indicates a long-term contract between actors. Hence, it was possible for pairs to build up the trust between themselves, in order to exchange high numbers - as these high numbers lead to higher payoffs to the partners – during the five rounds of game. The results of the laboratory experiment showed several interesting facts. First, as was shown in previous studies, the ‘reciprocity’ between employers and employees was observed in this experiment, that is, a higher wage led to higher effort-levels chosen by employees. This reciprocal behavior was observed in both non-leave and leave groups. Moreover, it was supported by the rank-correlation and regression models. However, although I assumed that the reciprocal behavior gets stronger over time due to building up the trust between actors. This assumption was not supported by the results of experiment. One of the reasons for this is, perhaps, that five rounds were not enough to develop trust. In future research, more periods will be required to examine whether if an increase in rounds leads to stronger reciprocity or not.

The main treatment, the absence of work (the leave period), was carefully considered by seeing the transformation over five periods. According to the figures, which described the changes in the

provision of wages and choosing effort-levels, the absence of work affects the decision-making of workers and employers, such that the increase in wage and effort level is diminished. The lack of increase in effort level might be stimulated by the small increase in the provision of wage, as both leave and non-leave groups showed reciprocal behaviors. However, it is crucial that differences in the provision of wages were found between non-leave and leave groups. A smaller increase in the provision of wages was observed in the non-leave group rather than in leave groups. This evidence might provide some insight into the empirically observed unfair treatment to women, as it is necessary for a mother to take some leave periods when she gives a birth.

What do the results in the game theoretic model and the experiment tell us? First, 'childcare' is the most important key to enhance the employment of female workers, who want to combine paid work and family life, according to the results of game theoretic model. The length of leave had mixed effects as it enhances both benefit and cost of a child. Moreover, the narrowing down the wage differences between female and male also increases the possibility of employment for women, because it gives higher motivation for balancing work and life.

In order to increase the gender equality in the society, an effort should be made to diminish gender wage gaps, so that the wage differences between a wife and husband would be reduced. The existing prevalence of wage differences between partners appear to create unequal decision-making, as the higher wage person would be more likely to engage in paid work, and thus the lower wage partner is more likely to take a leave. Another way to create equal relationships could be an increase in the replacement rate of wage for the lower wage group, since it makes the benefits of husbands

and wives indifferent during the periods of leave. Lastly, it was obvious that the absence of work had a negative impact on the increase in wage. This impact creates problems for women, if they need to take a longer leave than males. Therefore, this unequal length of leave could be modified by a policy, which suggests a mandated equal length of leave for a husband and wife, so that the length of absence in work would be equal between male and female workers who have a child.

6. Conclusion

This thesis addressed the issue of female lifecycle decisions with considerations of multiple factors, such as the provision of family policy, status of spouses, and lifestyle preferences of women. The main attention was paid to the influence of firms. I constructed a sequential game theoretic model between a firm and a female worker. Additionally, the interactive decision-making between two actors was observed in a laboratory setting, which controlled any exogenous factors. The results of these two methods suggested effective solutions to create equal opportunities for both genders within households, and for gender equality in society.

There are several limitations in this study. These can be addressed in future research. First, the effect of a ‘fine for not offering leave’ in the game theoretic model should be carefully considered, so that I could take the probability and cost of court into account. These are important factors, because the cross-national differences in rules of court are found. Moreover, these might change the decisions of a firm dramatically. Moreover, for simplicity, working hours were not included into the model. It is important to consider these in an extended model. Additionally, the laboratory experiment should be tested in a different country to examine whether or not cultural difference exists. Furthermore, the initial wage and effort level could be set by author, so that any changes in the provision of wage and effort level could be easily observed.

Although some limitations are left, this study significantly contributed to the literature on gender inequality and female lifecycle decisions. The influence of firms on the lifecycle decisions of

female workers was absolutely substantial. An extension of my game theoretic model and revised laboratory experiments will prove more effective evidence, which could lead to more gender equal relationships within households and society.

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